

What Works Clearinghouse



Saxon Middle School Math

Program description

Saxon Math curricula and materials are available for grades K through 12, with the content and skills designed to meet National Council of Teachers of Mathematics (NCTM) standards and various state standards. This WWC report focuses on middle school math curricula, defined as all *Saxon Math* curricula for grades 6 through 9. The sixth-grade curriculum covers simplifying expressions containing parentheses, graphing functions, and understanding ratios and proportions. The seventh-grade curriculum covers pre-algebra topics such as rate, powers,

roots, and geometric proofs. The eighth-grade curriculum covers all topics usually taught in pre-algebra in addition to topics from geometry and discrete mathematics. The ninth-grade curriculum covers all topics usually taught in a first-year algebra course (such as exponents, roots, and algebraic word problems) as well as conceptual understanding, procedural fluency, strategic competence, adaptive reasoning, and productive disposition. *Saxon Math* curricula for the elementary schools are reviewed in the [WWC Saxon Elementary School Math intervention report](#).

Research

One study of *Saxon Middle School Math* met What Works Clearinghouse (WWC) evidence standards, and five studies met standards with reservations. The six studies included over

5,300 students in sixth to ninth grades from over 70 schools in Georgia, Missouri, Mississippi, Nebraska, Oklahoma, and Texas.¹

Effectiveness

Saxon Middle School Math was found to have positive effects on math achievement.

	Math achievement
Rating of effectiveness	Positive effects
Improvement index ²	Average: +8 percentile points Range: -5 to +24 percentile points

1. The evidence presented in this report is based on available research. Findings and conclusions may change as new research becomes available.
 2. These numbers show the average and range of improvement indices for five of the six studies. One additional study that showed indeterminate effects is not included in this average and range.

Additional program information

Updating previous research

This report updates the previous WWC report on *Saxon Middle School Math* that was released on the WWC website in December 2004. Since the release of the previous report, the WWC has updated its evidence standards and developed peer-reviewed procedures for addressing certain methodological flaws in original studies, such as mismatch between the unit of assignment and the unit analysis and lack of adjustment for multiple comparisons. These standards and procedures have been applied to studies included in the original review where appropriate. Moreover, seven new studies were identified for this updated report.

Developer and contact

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Scope of use

Saxon Middle School Math's first textbook (*Algebra I* for ninth grade) was adopted in 1980; *Saxon Algebra ½* (eighth grade) was first adopted in 1986. Information about the number and demographics of students, schools, or districts currently using the intervention is not available.

Teaching

The *Saxon Middle School Math* curriculum for each grade level consists of 120 daily lessons and 12 activity-based investigations. A daily lesson consists of warm-up activities (10–15

minutes) for building automatic recall of math foundations in the areas of computational skills and facts, number sense and problem solving, introduction to the new concept (5–10 minutes), and distributed practice to strengthen understanding of previously learned concepts (20–30 minutes).

Teachers are responsible for facilitating and mediating the warm-up session, introducing the new concept, and conducting the practice sessions. Teachers introduce the daily concept using manipulatives or representative models accompanied by procedures needed to solve the problem. Teachers are instructed to conduct lessons in sequence, not skip lessons, limit direct group or individual instruction to 10–15 minutes, assign all problems in each problem set, and spend the majority of class time allowing children to do mathematics problems in the problem sets.

Technical assistance includes in-service training and videos, a web-based teacher resource center, answers to specific questions via email, a teacher helpline, resource materials, teachers' resource booklets, and administrators' guides to implementing *Saxon Math* in the classroom.

Cost

The cost of a student edition textbook ranges between \$51 and \$54, and is available in hard copy or on CD. The Adaptations for *Saxon Math Classroom Package* (\$32) contains a teaching guide, student reference guide, and student materials on CD. This package contains modified parallel support for special education and other students with learning disabilities. The Adaptations for *Saxon Math Classroom Package* student workbook is \$26. A manipulative kit costs \$295. The cost of additional materials is specified on the publisher's website.

Research Thirteen studies reviewed by the WWC investigated the effects of *Saxon Middle School Math*. One study (Williams, 1986) was a randomized controlled trial that met WWC evidence standards. One study (Peters, 1992) was a randomized controlled trial that met WWC evidence standards with reservations.³ Four studies (Crawford & Raia, 1986; Resendez, Fahmy, & Manley, 2005; Resendez & Manley, 2005; and Roberts, 1994) were quasi-experimental designs that met WWC evidence standards with reservations. The remaining seven studies did not meet WWC evidence screens.

Met evidence standards

Williams (1986) included 46 ninth-grade students in one high school⁴ serving a rural-suburban community in Missouri. The intervention group used the *Saxon Math Algebra 1* textbook and the comparison group used the *Algebra 1* textbook by Dolciani.

Met evidence standards with reservations

Crawford & Raia (1986) was a quasi-experimental design study that investigated the effects of *Saxon Middle School Math* on 78 eighth-grade students in four middle schools in Oklahoma. Students in classrooms taught with the *Saxon Algebra ½* textbook were compared with students in classrooms taught with the *Scott Foresman Mathematics* text.

Peters (1992) was a randomized control trial with 36 eighth-grade “math-talented” students from one junior high school in

Nebraska. Students in the intervention group used the Saxon Algebra program while students in the comparison group used the University of Chicago School Mathematics Project textbook.

Resendez, Fahmy, & Manley (2005) was a quasi-experimental design study that looked at a representative sample of over 6,300 students from 16 schools in Texas. Students using the Saxon program textbooks (*Saxon 76*, *Saxon 87*, or *Algebra ½*) were compared with students taught with either a topic-driven basal math text or an investigative approach focused on making connections among mathematics topics.

Resendez & Manley (2005) was a quasi-experimental design study that looked at eighth grade students from 28 schools from the state of Georgia. Students using the Saxon program (*Saxon 76*, *Saxon 87*, *Algebra ½*, or *Algebra 1*) were compared with students who used a topic-driven basal math text, an investigative approach focused on making connections among mathematics topics, or an amalgam of computer-based programs, basal textbooks, investigative techniques, and non-textbook printed material.

Roberts (1994) was a quasi-experimental design study that included 185 students from six schools in two districts in rural Mississippi. Students using the Saxon program (*Saxon 76*, *Saxon 87*, or *Algebra ½*) were compared with students using the basal textbooks *Mathematics* (in the seventh grade) or *Mathematics Unlimited* (in the eighth grade).

Effectiveness Findings

The WWC review of interventions for *Saxon Middle School Math* addresses student outcomes in one domain: math achievement.⁵

Williams (1986) reported statistically significant differences favoring the intervention group on students’ gains in total mathematics test scores, and this finding was confirmed by the WWC analysis.

3. Peters (1992) compared *Saxon Math* to *UCSMP Algebra*, described in the [UCSMP Algebra intervention report](#). The study indicates that a random selection of numbers was used to divide the 36 participants into intervention and comparison groups, but due to scheduling problems, the randomization was compromised. Despite this problem, the study meets standards with reservations because the statistical analysis controlled for baseline differences.
4. This study was accepted for review because the focus of this topic review is on grades six through nine regardless of setting (that is, middle school, junior high school, or high school). For further details, see the [Middle School Math Protocol](#).
5. Additional analyses were done after removing schools that scored at the extremes (one treatment, one comparison); however, no statistically significant differences were found in those analyses.

Effectiveness *(continued)*

Peters (1992) reported no statistically significant differences between the intervention group and the comparison group on the Orleans-Hanna Prognostic Test.

Crawford & Raia (1986) reported statistically significant differences favoring the intervention group on students' total scores on the math sub-test of the California Achievement test, and this finding was confirmed by WWC analysis.

Roberts (1994) reported no statistically significant differences between the intervention and comparison groups on the Stanford Achievement Test Eighth Edition math test.

Resendez, Fahmy, & Manley (2005) found statistically significant differences favoring the intervention group on the math portions of both the Texas Assessment of Academic Skills (TAAS; TLI score), and the Texas Assessment of Knowledge and Skills (TAKS), and these findings were confirmed by the WWC analysis.

Resendez & Manley (2005) found no statistically significant differences between the intervention and comparison group using total scores on the Criterion Referenced Competency Test (CRCT).

In sum, three of the six studies reviewed reported statistically significant positive effects. The remaining three studies showed indeterminate effects.

Rating of effectiveness

The WWC rates the effects of an intervention in a given outcome domain as positive, potentially positive, mixed, no discernible effects, potentially negative, or negative. The rating of effectiveness takes into account four factors: the quality of the research design, the statistical significance of the findings,⁶ the size of the difference between participants in the intervention condition and the comparison condition, and the consistency in findings across studies (see the [WWC Intervention Rating Scheme](#)).

The WWC found *Saxon Middle School Math* to have positive effects for math achievement

Improvement index

The WWC computes an improvement index for each individual finding. In addition, within each outcome domain, the WWC computes an average improvement index for each study and an average improvement index across studies (see [Technical Details of WWC-Conducted Computations](#)). The improvement index represents the difference between the percentile rank of the average student in the intervention condition versus the percentile rank of the average student in the comparison condition. Unlike the rating of effectiveness, the improvement index is entirely based on the size of the effect, regardless of the statistical significance of the effect, the study design, or the analysis. The improvement index can take on values between -50 and +50, with positive numbers denoting favorable results. The average improvement index for math achievement is +8 percentile

points across five studies, with a range of -5 to +24 percentile points across findings. One study that showed indeterminate effects is not included in this average and range because student-level statistical information was not available.

Summary

The WWC reviewed 13 studies on *Saxon Middle School Math*. One study met WWC evidence standards and five studies met WWC evidence standards with reservations; the remaining seven studies did not meet WWC evidence screens. Based on the six studies reviewed, the WWC found *Saxon Middle School Math* to have positive effects on students' math achievement. The evidence presented in this report may change as new research emerges.

6. The level of statistical significance was reported by the study authors, or where necessary, calculated by the WWC to correct for clustering within classrooms or schools and for multiple comparisons. For an explanation, see the [WWC Tutorial on Mismatch](#). See [Technical Details of WWC-Conducted Computations](#) for the formulas the WWC used to calculate the statistical significance. In the case of *Saxon Middle School Math*, corrections for clustering and multiple comparisons were needed for part of the studies reviewed.

References **Met WWC evidence standards**

Williams, D. D. (1986). *The incremental method of teaching algebra I*. Kansas City: University of Missouri.

Met WWC evidence standards with reservations

Crawford, J., & Raia, F. (1986). *Analyses of eighth grade math texts and achievement*. Oklahoma City, OK: Oklahoma City Public Schools, Planning, Research, and Evaluation Department.

Peters, K. G. (1992). Skill performance comparability of two algebra programs on an eighth-grade population. *Dissertation Abstracts International*, 54(01), 77A. (UMI No. 9314428)

Resendez, M., & Manley, M. A. (2005). *The relationship between using Saxon Elementary and Middle School Math and student performance on Georgia statewide assessments*. Orlando, FL: Harcourt Achieve.

Resendez, M., Fahmy, A., & Manley, M. A. (2005). *The relationship between using Saxon Middle School Math and student performance on Texas statewide assessments*. Retrieved from Harcourt Achieve Web site: http://saxonpublishers.harcourtachieve.com/HA/correlations/pdf/s/SXMath_Middle_TX_research_web.pdf

Roberts, F. H. (1994). The impact of Saxon Mathematics program on group achievement test scores. *Dissertation Abstracts International*, 55(06), 1498A. (UMI No. 9430198)

Did not meet WWC evidence screens

Baldree, C. L. P. (2003). *The effectiveness of two mathematical instructional programs on the mathematics growth of eighth grade students*. Unpublished doctoral dissertation, University of Georgia, Athens.⁷

Clay, D. W. (1998). A study to determine the effects of a non-traditional approach to algebra instruction on student achievement. Unpublished master's thesis, Salem-Teikyo University, Salem, WV. (ERIC Document Reproduction Service No. ED428963)⁸

FitzPatrick, S. B. (2001). An exploratory study of the implementation of an interactive learning system in two eighth grade mathematics classes. *Dissertation Abstracts International*, 62(06), 2082A. (UMI No. 3016656)⁹

Imrisek, J. P. (1989). *Incremental development: A more effective means of mathematics instruction?* Unpublished master's thesis, Bloomsburg University, Bloomsburg, PA.¹⁰

Lafferty, J. F. (1996). The links among mathematics text, students' achievement, and students' mathematics anxiety: A comparison of the incremental development and traditional texts. *Dissertation Abstracts International*, 56(08), 3041A. (UMI No. 9537085)⁹

Rentschler, R. V. (1994). The effects of Saxon's incremental review on computational skills and problem-solving achievement of sixth-grade students. *Dissertation Abstracts International*, 56(02), 484A. (UMI No. 9518017)⁹

Saxon, J. (1982). Incremental development: A breakthrough in mathematics. *Phi Delta Kappan*, 63(7), 482–84.⁸

For more information about specific studies and WWC calculations, please see the [WWC Saxon Middle School Math Technical Appendices](#).

7. Lack of evidence for baseline equivalence: this study, which used a quasi-experimental design, did not establish that the comparison group was equivalent to the intervention group at baseline.

8. Confound: there was only one intervention and one comparison unit, so the analysis could not separate the effects of the intervention from other factors.

9. Does not use a strong causal design: this study reports qualitative empirical data for *Saxon Math*.

10. Confound: there was only one teacher in each study condition, so the analysis could not separate the effects of the intervention from the effects of the teacher. Since the researcher acted as the one teacher for both conditions, teacher bias cannot be discounted.